
Executive Summary

Water Reuse Policy 2 (WRP-2) in King County's Regional Wastewater Services Plan (RWSP) calls for preparation of a reclaimed water feasibility study by December 2007.¹ The full text of the policy is as follows:

WRP-2: By December 31, 2007, the King County executive shall prepare for review by council a reclaimed water feasibility study as part of a regional water supply plan which will include a comprehensive financial business plan including tasks and schedule for the development of a water reuse program and a process to coordinate with affected tribal and local governments, the state and area citizens. The reclaimed water feasibility study shall be reviewed by the RWQC.² At a minimum the feasibility study shall comply with chapter 90.46 RCW and include:

1. Review of new technologies for feasibility and cost effectiveness, that may be applicable for future wastewater planning;
2. Review of revenue sources other than the wastewater rate for distribution of reused water;
3. Detailed review and an update of a regional market analysis for reused water;
4. Review of possible environmental benefits of reused water; and
5. Review of regional benefits of reused water.

In addition to meeting specific provisions of WRP-2, this feasibility study provides a compendium of local, state, and national information that will be useful in developing King County's reclaimed water program. The county has long recognized that the reclaimed water produced at its wastewater treatment plants is a valuable resource with potential offsite uses. The study affirms the county's goal of finding appropriate uses for reclaimed water in places where it can provide environmental, social, or financial benefits.

The regional water supply plan, which was expected to be completed by the end of 2007 and which was to incorporate this feasibility study, has not yet been done. The regional water supply planning process is generating a set of reports from technical committees on different topics, including reclaimed water. The last such report is due in September 2008.³ Information developed during the regional water supply planning process and during this reclaimed water feasibility study, along with comments from council members and stakeholders, will inform the development of the reclaimed water comprehensive plan. The Wastewater Treatment Division will work with its stakeholders to develop the comprehensive plan. The process, to be completed by 2010, will include participation by water purveyors, local sewer agencies, tribal governments,

¹ The RWSP was adopted in 1999; Water Reuse Policy 2 was amended in September 2006 by King County Ordinance 15602.

² RWQC = Regional Water Quality Committee.

³ See <http://www.govlink.org/regional-water-planning/index.htm> for more information and for completed reports from the regional water supply planning process.

cities, environmental groups, and the public. This feasibility study includes a schedule and basic outline for the process.

Developing a comprehensive strategy for reclaimed water use is particularly important as King County embarks on two critical regional efforts—restoring Puget Sound by 2020 and developing a comprehensive strategy for adaptation to the impacts of climate change. By increasing the use of reclaimed water, the county reduces wastewater discharges to the Sound and provides a drought-resistant source of water that can generate a range of benefits for use in a broad water resource management strategy.

This study also introduces the potential uses of a new benefit-cost analysis tool developed by the WateReuse Foundation.⁴ This tool provides an integrated approach that weaves together information on technologies, benefits, costs, revenues, and market demand to determine the types of projects that could provide the greatest benefits. The tool was presented to the reclaimed water technical committee that was formed as part of the regional water supply planning effort and was applied to two possible examples that committee members nominated. Use of benefit-cost analysis can help inform decisions about potential future investments in reclaimed water or other elements of a water resource management program.

As discussed in the study, the West Point and South Treatment Plants have been producing and using reclaimed water onsite since 1997. South plant also provides reclaimed water for offsite uses. The future Brightwater and Carnation Treatment Plants are being equipped with state-of-the-art membrane bioreactor technology that will treat the wastewater at these plants to Class A reclaimed water standards, offering significant quantities of reclaimed water for appropriate and authorized uses. Reclaimed water from the South Segment of the Brightwater backbone pipeline will be available beginning in 2011. This water can be used for irrigation in place of water that is drawn from salmon-bearing rivers and streams or from sometimes over-tapped groundwater aquifers. Reclaimed water produced at the Carnation Treatment Plant will be used to enhance a degraded wetland at the Chinook Bend Natural Area. This beneficial use will restore fish and wildlife habitat and will reduce direct discharge of effluent to the Snoqualmie River.

The following summary begins with major findings from the study and then provides information on how we arrived at these findings. It concludes with a description of how the reclaimed water comprehensive plan will extend the discussion of the issues identified in WRP-2, will address other relevant issues, and will produce a comprehensive strategy by 2010 for a long-term, progressive reclaimed water program for King County and the region.

What Have We Learned From This Study?

This feasibility study represents one part of a continuum in developing the county's reclaimed water program—a continuum that includes the start of reclaimed water production at county treatment plants in 1997 and continuing through the planned preparation of a reclaimed water

⁴ Raucher, R., K. Darr, J. Henderson, R. Linsky, J. Rice, B. Sheikh, and C. Wagner. 2006. *An Economic Framework for Evaluating the Benefits and Costs of Water Reuse*. Alexandria, VA: WateReuse Foundation.

comprehensive plan that will build on the feasibility study. Major findings of the study are described below.

Reclaimed water is a feasible and potentially cost-effective wastewater management tool.

Reclaimed water in Washington State is being used for an increasing number of purposes, including irrigation, industrial processes, and environmental enhancement.

Puget Sound recovery efforts highlight the need for King County to be poised for more stringent discharge requirements. Treatment technology that produces reclaimed water is becoming a standard wastewater treatment pathway, with unit treatment costs declining. By incorporating use of reclaimed water into wastewater planning that already includes such treatment technologies, investments can be leveraged into production of a product that has value and can be sold.

Wastewater plants discharging into Puget Sound are being encouraged, and aided financially, to move to upland discharge via use of reclaimed water. Modest reclaimed water investments made now will enable King County to meet today's permit requirements while positioning the agency to cost-effectively meet more stringent future discharge requirements. For example, two King County treatments plants under construction—Brightwater and Carnation—will use membrane bioreactor treatment technology, which will generate reclaimed-quality water that can be used as a product for irrigation, industrial processes, environmental enhancement, or other uses authorized under Washington State standards.

Treatment technologies at existing and planned county facilities are appropriate for most identified reclaimed water uses in this region.

The feasibility study confirmed that membrane bioreactor technology, which is planned for the future Carnation and Brightwater Treatment Plants, and sand filters, which are being used at the South and West Point Treatment Plants, are appropriate treatment technologies for the majority of reclaimed water uses identified in this region. These technologies are capable of producing the highest class of reclaimed water under existing and anticipated state standards. Promising technologies, such as reverse osmosis, are being developed and tested but are for the moment more expensive and provide little if any additional benefit for either wastewater treatment or reclaimed water purposes.

Sources of revenue for reclaimed water distribution lines are varied and may be increasing.

A key element of cost recovery for reclaimed water facilities is determining the appropriate allocation of costs to the wastewater utility (borne by the wastewater rate) and to others (preferably borne by the reclaimed water customers and other project beneficiaries). A review of funding strategies nationally for recovering reclaimed water costs shows a variety of strategies, including broad-based rates and dedicated fees, that have been successfully employed. At the federal level, legislation directed at potential impacts of climate change on water supplies is

beginning to incorporate funding of reclaimed water projects to provide more efficient use of existing resources. The Washington State Department of Ecology (Ecology) recently announced its priority list for \$5.5 million worth of reclaimed water projects that will contribute to restoration of Puget Sound, including two potential projects in King County. The Washington State Legislature has directed Ecology to convene committees to address barriers to further use of reclaimed water, including the lack of a dedicated funding source. That committee has recommended an initial approach, with a dedicated funding source, that would provide \$50 million annually within the state.

A benefit-cost analysis can identify environmental, social, and financial benefits of reclaimed water projects.

Identifying environmental, social, and financial benefits directly allocable to reclaimed water provides complete information for decision-makers in assessing the full value of a project to the community and region, and is essential in assessing the merits of a reclaimed water project. This is the approach developed by the WaterReuse Foundation in its economic framework for evaluating reclaimed water projects. The framework is based on a “triple bottom line” analysis that has become more common in utility planning.

There is a market for reclaimed water projects in King County.

The potential cost is likely the major barrier to developing reclaimed water projects in the county. Critical to addressing this issue is the appropriate allocation of costs between the wastewater program (as wastewater treatment or regulatory compliance) and the reclaimed water program (as a water resource). Projects that reduce the costs allocated to the reclaimed water program or that have some prospect of shared or dedicated funding would be the most likely to proceed. These projects would include conditions such as the ones described below:

- Providing reclaimed water is either a requirement or secondary benefit of new or upgraded wastewater facilities and all or a significant portion of the cost is properly attributed to the development of the wastewater system.
- The reclaimed water demand is located sufficiently close to the supply so that the distribution costs are minimized.
- The reclaimed water is needed to mitigate or benefit another environmental objective, such as wetland enhancement, farmland preservation, or groundwater recharge, for which other entities besides the wastewater utility will contribute to the cost of the reclaimed water.

Other projects that are likely to be pursued are those where demand outstrips available or future supply, where the reliability of the existing supply (due to environmental, legal, or other issues) may be in question, or where the potential user views the use of reclaimed water as good public policy. In these cases, cost may be a less important determinant. In addition, regional needs—such as providing additional water to ensure the success of watershed-based salmon recovery plans or of regional strategies to address the impacts of climate change—may foster regional approaches to development of reclaimed water. Regional analyses of streamflow needs and of impacts from climate change have yet to be done.

The level of interest in and need for reclaimed water vary across potential wholesale customers, and are continuing to be explored.

Some water and wastewater agencies want reclaimed water now to enhance their water resources and the environment. Others see uses for reclaimed water in their service areas in the next 10 years. Several agencies, such as those served by the City of Everett or Seattle Public Utilities, state that they have a secure water supply for years to come. They view investing now in additional reclaimed water facilities strictly as a source of supply as premature. Seattle Public Utilities is about to embark on its own evaluation of the potential for future reclaimed water projects near the area that could be served by the West Segment of the Brightwater backbone pipeline.

Public education, outreach, and research and development are essential to maintain public support and a market for reclaimed water.

Information on reclaimed water programs in Washington and other states reviewed for this study underscores the importance of outreach and research efforts in building successful programs. Potential wholesale customers and retail users in King County substantiated the importance of this need. Local research that answers specific questions regarding reclaimed water safety and quality will provide a strong foundation for projects and will further King County's efforts to protect public health and the environment.

Issues, such as liability for reclaimed water use, may not be a barrier to use in King County.

The past 10 to 20 years use of reclaimed water use throughout the country has demonstrated its safety. A review by insurance underwriters for King County concluded that there had been no liability claims filed anywhere in the country against a reclaimed water project owner because of alleged health problems with the water. Based on that history, King County has taken the position that it will hold harmless any wholesale customers of its reclaimed water, provided that the water is used consistent with permit terms and applicable state requirements.

A comprehensive reclaimed water plan is needed that identifies and prioritizes water resource management needs for a full range of beneficial uses.

A more detailed analysis than could be completed in this timeframe needs to be done to determine which reclaimed water projects are most feasible. The comprehensive planning process needs to involve internal and external stakeholders and to include an environmental review. The resulting plan will consist of policies for pricing, cost recovery, and allocation. The policies and overall plan will provide guidance for designing a reclaimed water system that can meet immediate demands and adapt to new demands over time, while ensuring compatibility with the operation of the regional wastewater treatment system. The plan will also identify specific projects and schedules.

What Is King County's Current Reclaimed Water Program?

King County's Wastewater Treatment Division (WTD) has developed a reclaimed water program in conformance with RWSP policies. Reclaimed water was an important issue during development of the RWSP. As a result, 15 water reuse policies were adopted. These policies provide direction to pursue the use of reclaimed water at all county treatment plants, coordinate with regional water supply planning efforts, work with local water purveyors, and evaluate and implement nonpotable water projects on a case-by-case basis.

WTD has been producing reclaimed water at its South and West Point Treatment Plants since 1997. Both plants use reclaimed water for onsite landscape irrigation and internal plant processes. South Plant also provides reclaimed water for offsite uses, including sports field irrigation in the City of Tukwila and habitat restoration.

Reclaimed water continues to serve as an important aspect of WTD's efforts to efficiently manage its water resources. The county's two newest treatment plants, both under construction, will treat their wastewater to reclaimed water standards. Reclaimed water from the Carnation Treatment Plant will be used to enhance nearby wetlands. Reclaimed water from the Brightwater Treatment Plant will be available through a backbone distribution line that runs south into the Sammamish Valley.

A review of reclaimed water treatment technologies illustrates the importance of matching technology to local standards, uses, needs, and conditions. WTD facilities produce high-quality reclaimed water through advanced treatment and disinfection technologies (sand filters, membrane bioreactors, and sodium hypochlorite or ultraviolet light disinfection) that meets the highest state standard for reclaimed water (Class A).⁵ Class A reclaimed water is required for most of the county's current and planned nonpotable applications. The review found that the technologies currently in use are appropriate for serving potential uses in the foreseeable future. The county will continue to assess other available technologies for their applicability and cost-effectiveness.

What Needs to be Considered in Evaluating Reclaimed Water Projects?

This feasibility study describes the differences between financial and economic analyses and then emphasizes the importance of performing a full economic analysis when evaluating reclaimed water projects.

A *financial analysis* indicates how anticipated revenues from sales of reclaimed water compare to incurred expenses. While financial analysis is important, it does not reveal the true worth or

⁵ State guidelines and standards include the Reclaimed Water Use Act of 1992 (Chapter 90.46 RCW) and the 1997 *Washington State Water Reclamation and Reuse Standards*.

value of reclaimed water to the community and region as a whole. An *economic analysis* (a benefit-cost approach) starts with the financial analysis but then examines the benefits of the reclaimed water project, including environmental and social benefits, and compares these to the costs.

Reclaimed water has the potential to generate a range of benefits for the region. When broad regional benefits are identified, such as increased streamflows, increased reliability, and offset of costs for upgrading the wastewater system, the net benefits of the project may be positive.

Agencies that produce reclaimed water to manage effluent discharge often set low prices or make long-term volume commitments as ways to provide incentives for using the water. When the value and demand for reclaimed water increases, the price can be raised to meet the demand.

Reclaimed water costs must be appropriately allocated between the wastewater utility, reclaimed water users, and other beneficiaries. Once that is done, an assessment of the revenue need for the reclaimed water costs is possible. For example, the LOTT Alliance in Thurston County sells its water to member agencies for \$1.00 per year; the costs of the major infrastructure (collection, treatment, transmission) are viewed as wastewater costs for the regional system. If there is a large potential market for end users that are not wastewater members, the unit price for reclaimed water may be very competitive. If there is a small market and few customers, some innovative cost-sharing or other cost-spreading mechanisms can be tapped. For example, in some areas in the country, broad taxes or fees are levied based on the perceived broad benefit.

Applying a benefit-cost analysis to identify all beneficiaries can point to potential sources of revenue. Such an analysis may reveal benefits to both water and wastewater utilities or broader environmental and social benefits that accrue to an entire community or region. Costs for reclaimed water projects nationwide are often borne by both wastewater and water revenues to reflect the benefits of reclaimed water to a broad base of individuals.

As the county's reclaimed water program moves forward to consider specific projects and facilities, it will be important to assess potential project drivers and beneficiaries, both current and future, in determining pricing structures and cost allocations that are transparent and equitable.

Potential Benefits of Reclaimed Water...

Environmental – Benefits could include reducing wastewater discharge to water bodies and enhancing instream flows.

Social – When a climate-independent source such as reclaimed water is added to a region's water portfolio, it can add reliability and value to a community's economic base. It can also be a hedge against increasing demands from anticipated growth in region-wide population and the impacts of climate change.

Financial – Potential local financial benefits include avoided costs of building conveyance or storage, revenue from the sale of reclaimed water, and use of reclaimed water for potable offsets or groundwater recharge.

Where Are Potential Uses for Reclaimed Water?

The updated reclaimed water market analysis built on studies conducted by the county and other agencies between 1995 and 2006. The analysis identified potential irrigation areas, groundwater recharge areas, and flow-limited streams near reclaimed water sources. Interviews with water and wastewater agencies helped to clarify this information and to identify interest in using reclaimed water in the near and far term.

The Pacific Northwest, like most regions of the world, is projected to experience changes in temperature, precipitation, and snowpack as a result of climate change. Changes in climate have, and are expected to continue to have, an increasing impact on water resources. As the seasonal patterns in surface water flow regimes change, water resource managers in the region may need to re-evaluate historical water use, resource management, flood control, instream flow regimes, and general development in the region. This analysis has already begun through the work of the Climate Change Technical Committee of the regional water supply planning process. More utilities and other entities will likely begin to incorporate such issues in their short-term and long-term planning.

Use of non-traditional resources, such as reclaimed water, can serve as a water resource management tool for adapting to changing conditions. In addition to reducing the amount of effluent discharged to Puget Sound, reclaimed water can help restore and protect instream flows, enhance wetlands, and recharge groundwater, thereby helping to preserve critical habitats in the region. The Freshwater Preparation and Adaptation Workgroup—part of the Governor’s Climate Initiative—identified in its December 2007 report the expanded use of alternative sources of water as one option to be pursued in an adaptation strategy to changed water resource circumstances in the future.

What Are the Next Steps?

The business plan prepared for this study presents activities for the next three or four years that will support existing reclaimed water production at the West Point and South plants and the development of programs at the Carnation and Brightwater plants. Activities include negotiating agreements with purveyors, providing support to customers, working with university researchers to answer technical questions, and developing public outreach programs.

In early 2008, WTD will begin a formal comprehensive planning process for reclaimed water. This process will give WTD the opportunity to work with local, state, federal, tribal, and business stakeholder groups to identify and prioritize water resource needs and the range of beneficial uses that can be met through reclaimed water. The process will address policy, economic, environmental, and technical issues. Alternatives will be developed and evaluated. The resulting reclaimed water comprehensive plan will define a comprehensive financial business plan beyond 2010.